

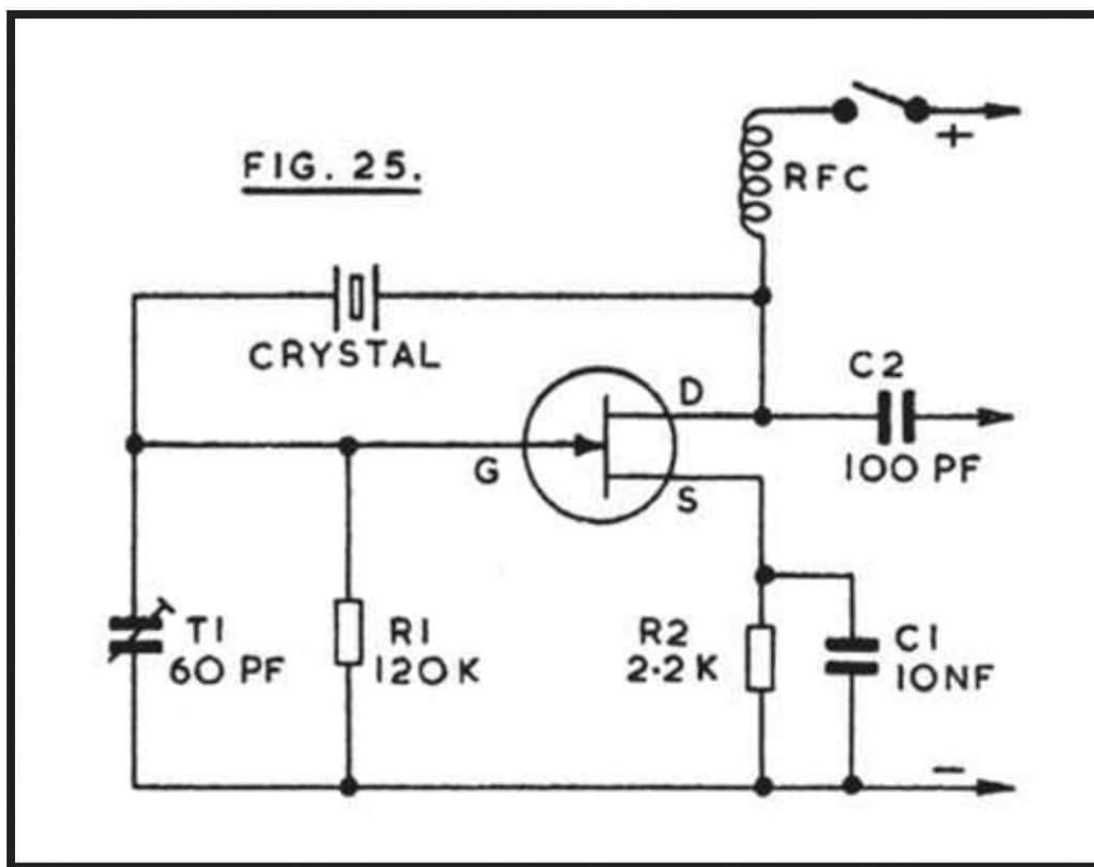
Crystal Markers

A crystal marker is commonly used by short wave listeners or amateurs to find or check frequency bands, to determine band limits, or to provide exact calibration of a receiver or other equipment. In fact, many of the better communications type receivers have such a marker incorporated.

The marker uses a crystal oscillator of high frequency accuracy, and it produces a range of harmonics, or multiples, of this frequency. As an example of the use of such a marker; assume that it has a 1MHz crystal. This produces a fundamental frequency of 1MHz, and harmonic output at 2MHz, 3MHz, 4MHz, and so on. These multiples can normally be detected up to 30MHz or higher, with a communications receiver of normal sensitivity. By counting these harmonics, at 1MHz intervals, across a waveband, or up or down from any known frequency, a receiver tuning scale can be checked with great accuracy. This also permits exact calibration of a home built signal generator, or similar equipment, by tuning the generator to various marker harmonics, meanwhile calibrating its scales.

The circuit in Figure 25 will be found suitable for crystals through the 1 MHz to 7MHz range, using a 2.5mH or similar RF choke. With some crystals and FETs, C1 and R2 can be omitted, though these help easy working of the circuit.

The value of the trimmer is not very significant, but will generally be around 50pF or so for 1MHz, 1.8MHz or 3.5MHz crystals, and unscrewed to 15pF or so for 7MHz crystals. No oscillation may be obtained if the value here is very unsuitable. There is usually no need for a supply of more than 9v.



Coupling from the marker to the receiver is generally not very critical. For fundamental frequencies or near harmonics, it may be sufficient to place the marker near the receiver aerial lead. But higher harmonics grow progressively weaker, and it is then necessary to place an insulated lead from C2 near the receiver aerial lead, or plug this connection into the receiver aerial socket.

The marker pips are unmodulated RF, so will be found by means of the receiver tuning meter, or by switching on the receiver beat frequency oscillator. (The BFO is a standard adjunct with a communications receiver, but can be fitted to other receivers as shown later.) The use of 1MHz harmonics, for calibration at 1MHz intervals as required, has been described. For amateur band purposes, a 1.75MHz or 3.5MHz crystal may be used. The 3.5MHz crystal would give marker pips at 3.5, 7, 14, 21 and 28MHz, as well as at 10.5MHz (3rd harmonic), 17.5MHz (5th harmonic) and other multiples. The latter are far removed from amateur frequencies, and may be ignored, or used to check receiver calibration generally.